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Enhance the Optical Properties of the Synthesis PEG/Graphene- Based Nanocomposite films using GO nanosheets

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Abstract. Graphene is one of the most interesting and attracting nanofillers. The investigation focused on the effect of two significant factors using graphene nanosheets and polymer molecular weights (Mw) on the optical properties of polymer graphene-based nanocomposites. New sonication-mixing-aquatic methods were applied using the three Mw, 4k, 8k and 20k of polyethylene glycol (PEG), as a polymer model, with low loading ratio graphene oxide nanosheets (GONSs) to synthesise the nanocomposites. Fine distribution and good homogeneity of GONSs were successfully presented in the PEG matrix as examined applying the optical microscope (OM). The results presented an enhance in the most optical properties, which shows significantly in the ultraviolet region (~300 nm in wavelength), such as, absorbance, absorption coefficient, real and imaginary dielectric constants up to 71%, 355%, 37% and 41% after increasing the Mw, except the allowed and forbidden indirect optical energy gap were reduced to 18% and 29%, respectively. Moreover, the contribution of GO with Mw of PEG exhibited a notable improvement of the optical properties up to 100%, 440%, 48% and 61%, whereas the allowed and forbidden indirect optical energy gap were reduced to 43% and 86%. These results illustrated significant roles of the effect of MW and GO in the optical properties that give rise to better photovoltaic performances of heterojunction solar cells and may use as filters and antireflection coating in the substantial applications.

Keywords: graphene, PEG, nanocomposite, optical properties, Molecular weight, films.

1. Introduction

Polymer nanocomposites consist of a polymeric substance and a nanoscale material. These materials show considerable improvements in different properties; mechanical, optical, thermal stability and chemical resistance etc. The enhancement of the properties with the addition of nanoparticles can be achieved due to different factors, one of the most important of them is a respectable interfacial interaction between the nanoparticles and the matrix with good dispersion of particles within the matrix (1,2). Poly (ethylene glycol) (PEG) has a flexible structure of C–O–C bonds and an essential type with of thermoplastic polymer, moreover PEG is considered a solubility in water and organic solvents and